Daylight Feasibility

OBJECTIVE

Determine how much daylight you can use in various areas of your building.

- Because daylight is not used simply to illuminate an interior space (e.g., view, outdoor connection, ventilation, egress), the issue is not whether or not to use a window, but whether one can capitalize on it to increase occupant comfort, satisfaction, and perhaps productivity.
- Determine how much daylight can be used to offset electric lighting needs.

KEY IDEAS

- **Windows must see the light of day.** A high density urban site may make daylighting difficult if the windows will not see much sky.
- **Glazing must transmit light.** A strong desire for very dark glazing generally diminishes the capacity to daylight in all but very sunny climates.
- **Install daylight-activated controls.** To save energy, lights are dimmed or turned off with controls. Automated lighting controls in a daylighted building can have other cost-saving applications (occupancy, scheduling, etc.) and benefits.
- **Design daylight for the task.** If the occupants require very bright light, darkness, or a highly controllable lighting environment, tailor the design solutions to meet their needs.
- **Assess daylight feasibility for each different portion of the building.** Spaces with similar orientation, sky views, ground reflectance, and design can be treated together. Within a single building, the feasibility and cost-effectiveness of daylighting may vary greatly.

PROVISO

- A low-rise building in a dense area can be adequately daylighted with skylights (skylights are not addressed in these guidelines).

TOOLS & RESOURCES

"Two-Minute" Feasibility Study

Complete this analysis for each major type of space in the building.

Step 1: Calculate the predicted window-to-wall ratio (WWR) for a typical bay or office.

Net glazing area (window area minus mullions and framing, or ~80% of rough opening) divided by gross exterior wall area (e.g., multiply width of the bay by floor-to-floor height) equals window-to-wall ratio (WWR).

_____________ / ___________________ = __________

net glazing area   gross exterior wall area   WWR

If unknown, use 0.35 for a typical, moderately strip-glazed building. If larger windows are anticipated, use 0.50. For smaller punched windows, use 0.25.

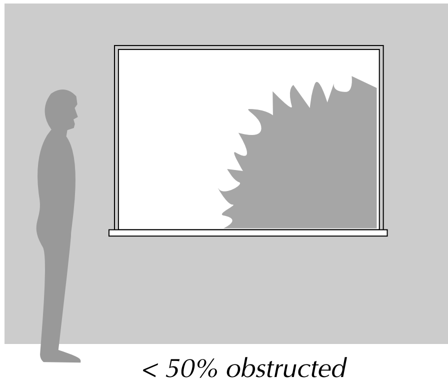
Step 2: Make a preliminary glazing selection and note the visible transmittance (V_T).

Generic Glazing type (1/4" panes)	Typical VT	Generic Glazing type (1/4" panes)	Typical VT
Single pane clear	0.89	Double pane tint - bronze	0.47
Single pane tint - green or blue-green	0.70	Double pane tint - gray	0.39
Single pane tint - blue	0.57	Double pane light reflective	0.30
Single pane tint - bronze	0.53	Double pane medium reflective	0.20
Single pane tint - gray	0.42	Double pane high reflective	0.10
Single pane tint - extra dark	0.14	Double pane low-E clear	0.70
Single pane light reflective	0.35	Double pane low-E tint - green or blue-green	0.63
Single pane medium reflective	0.25	Double pane low-E tint - blue	0.49
Single pane high reflective	0.12	Double pane low-E tint - bronze	0.45
Double pane clear *	0.80	Double pane low-E tint - gray	0.37
Double pane tint - green or blue-green	0.65	Suspended low-E film products	0.27-0.60
Double pane tint - blue	0.51		

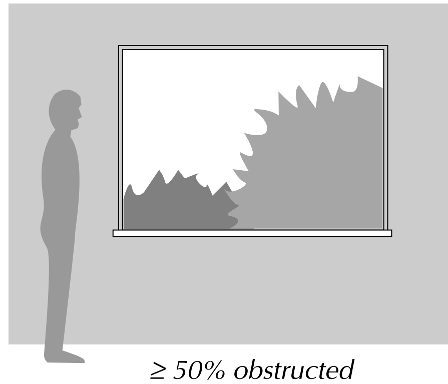
* Double pane numbers also apply to laminates.

Step 3: Estimate the obstruction factor (OF).

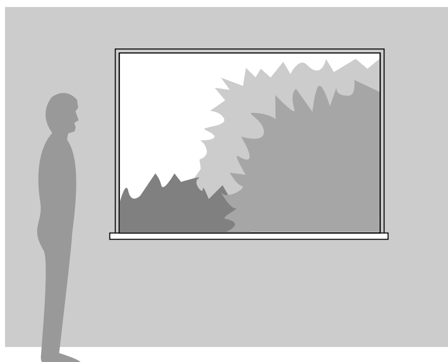
Visualize a typical task location, 10 feet (3.3 m) in from a window and centered on the window. What is the view through the predicted window from desk height? Pick a location that represents an average view for the building. Sketch the window elevation and shade in anticipated objects seen from this viewpoint. Select the obstruction factor as shown in diagram on page 3.



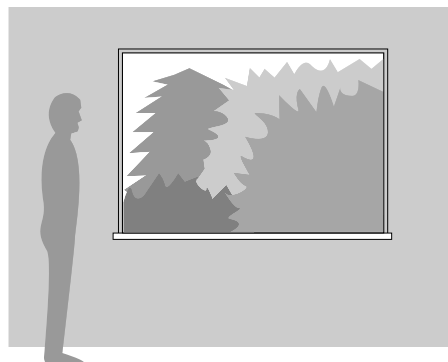
< 50% obstructed
OF = 1



≥ 50% obstructed
OF = 0.85



≥ 70% obstructed
OF = 0.65



≥ 90% obstructed
OF = 0.40

Step 4: Calculate the feasibility factor.

Window-to-wall ratio multiplied by visible transmittance multiplied by obstruction factor equals feasibility factor.

______	x	______	x	______	=	________________
WWR		V_T		OF		Feasibility Factor

If Feasibility Factor ≥ 0.25, then daylighting has the potential for significant energy savings. If Feasibility Factor < 0.25, then consider removing obstructions, increasing window area, or increasing V_T. If these modifications are not possible, it is unlikely that daylighting will be a cost-effective energy-saving strategy. However, windows can still be designed to provide views and to control glare. Use these guidelines for glare reducing ideas.

Source: *Daylighting Manual*, Public Works, Canada, March 1990.